The monitoring wells we installed were kind of unique because we're aiming for a vertical target in any case. So instead of going out and drilling a vertical well and intercepting on the way, sandstone or something, like we do in many projects, we had to back off and drill the bore holes, and many of them at an angle, to be able to intercept this coal seam. So some of the wells you'll see, the shallow and the deep ones and also the one that was constructed on the Landsburg Seam, were drilled at an angle to be able to intercept these vertical coal seams. Kind of unique drilling.

Well, we aimed for summer, and that's what we got. The monitoring wells were installed during late 1993 and early 1994, as many of you know. The weather did improve a little bit as we went along.

This shows one of the angle bore holes being constructed. I know many of you that are from this area saw the operations as we were going, and we certainly appreciate your patience. Some of them went a little bit longer than we anticipated. This was the one by the Landsburg Summit Road up at the north end of the mine site, and this is the angle bore hole being done. Some of them went a little late in the night, and we apologize if it was an inconvenience to anyone. No, this wasn't hit by a truck. That's what the mines looked like for an angle bore hole. And this is, basically, what the monitoring wells look like when they are done.

As we talked about, here is the actual mine. LMW-3 and 4 by the portals, by the power line, were drilled in this area to intercept the working here in the shallow coal. LMW-1 was drilled to intercept some fractured rock adjacent to this gangway that crosses here, to provide a good sampling point here mid-mine. And then LMW-2 and 4 were installed deep within the coal seam, down here at the north end, above the Cedar River on this little terrace, right at the very north end of the mine operations. Two additional wells we talked about were installed in the adjacent seam to the east and to the west. So a total of seven monitoring wells were installed.

This shows a cross-section. And here it's kind of hard to see, but you can see the angle that LMW-4 intercepted the coal seam here. These were kind of fun to put in. We ran inclinometer surveys. It required quite a bit of geophysics to actually find the spot and start drilling and make sure that you hit the coal seam where you thought it would. But our shooting was pretty good, and we managed to place the monitoring well screens where we needed to within the coal seams.

So we, basically, performed four quarters -- one year -- ground water monitoring on 14 private wells -- actually, three quarters on 14, the fourth quarter, only seven private wells. And then seven installed monitoring wells, which were very precisely located to be able to see if there was any contamination coming into the mine.

So what were the results of the ground water sampling? Basically, no federal maximum contaminant levels were exceeded. Some secondary contaminant levels, basically, for aluminum, iron, manganese and total dissolved solids were exceeded sporadically throughout the study area. They exceeded in areas that had no relevance to the mine, that were thought to be background wells, either wells that were high on the hill; you know, up -- gradient, potentially, from the mine. So they tend to represent, really, background situations for the area. No indication of any organic contamination in the ground water at the mine site, and the ground water quality that was found was, basically, consistent with coal mine drainage water. In other words, there is some minor organic materials that come out from coal mines. And besides these, we really did not seem to get --

MR. SOUTH: What is a secondary?

MR. PANCOAST: A secondary MCL tends to be things like iron and manganese that are more of a quality; for example, like manganese --

MR. SOUTH: Is that a nonorganic --

MR. PANCOAST: It's more aesthetic. In other words, they set iron and manganese levels so your toilet doesn't turn black. They don't really pose so much of a health risk as their aesthetic quality to water. Thanks, Dave. That's a good point.

The results of the soil sampling that was conducted around the trench basically indicated that the levels of chemicals detected in soils outside the trench are consistent with background levels. In other words, we didn't see any type of contamination. Chemicals associated with any prior waste disposal appear to be confined primarily to within the northern portion of the trench.

The contaminants of concern for ground water; basically, there were none. For surface water, there were no contaminants of concern. For air, we did not find anything on any of the air monitoring conducted within the trench in the close proximity of the waste disposal. In the soils outside of the trench -- in other words, outside on the periphery of the actual trench, on the rim -- there were no contaminants of concern detected. And basically, inside the trench, from a previous study of actually sampling some of the contaminated soils, the contaminants of concern were chromium, lead, PCBs, total petroleum hydrocarbons, bisphthalate, which is a plasticizer, methylene chloride, and trichloroethylene. And again, these were within the trench.

So the key conclusions that came out of the RI, the Remedial Investigation, is that, basically, the potential buried waste is confined to the northern half of the trench, subsidence trench. From the geophysics and studying that was done, there were no waste constituents that were exiting the mine, surface water, water flowing out of the portals, or the ground water. That the contamination appears to be confined totally to soils and buried waste that are down in the bottom of the trench.

So the other significant question is, what happened to the waste. Well, again, it's a very unique site, and so we have to get back to, what is the geology, and what's been the history of the site. As you recall, there was a series of very large, multi-day fires that occurred back in '72. These were huge -- you know, 100-foot flames -- and burned for days. So obviously, we have to figure that a lot of the waste was consumed that was there at that time. It was consumed in those fires. There also was probably a fairly rapid movement of liquids that may have been dumped from tanker trucks and that sort of thing, out of this really highly conductive mine slot. And this is what is so unique about the Landsburg Mine, is, instead of having a flat, layered geology system that we're used to where we drop some little contaminant, and it sinks down to the ground, and it flows in the plume, kind of based on which way the ground water is flowing. In the Landsburg site, it tends to be a vertical slot. Instead of radiating out in different directions, the flow at Landsburg is confined. We have all those layers of soil and layers of rock, and it's very hard for the water to pass through these layers. It much prefers to flow down this localized slot of this little mine. So the water tends to flow along the preferential pathway, and it's a very rapid movement. It's almost like having a trench dug into the ground that's filled with gravel. We dump some water in this end, and it flows out very rapidly. So there probably was a fairly rapid movement of what liquid was disposed, out of the system.

There is also a very unique case here in Landsburg. For years, many of these disposal sites that we look at were put in locations that were probably not the best, to put it mildly. A lot of the old gravel pits, places with sand quarries, this sort of thing, is very highly conductive. Waste gets in, flows with the ground water system, and moves very rapidly through the system. Here we have preferential pathways we talked about, which tend to flow one direction out of the system. And the system it's flowing through is carbonation. A carbon system. So we have very interesting phenomena occurring in the Landsburg Mine; that we probably have some absorption of the various organic contaminants to coal and perhaps some of the different metals. So we have some absorbent qualities, kind of like activating carbon that we use, doing a lot of the remedial cleanups. We have a little bit of carbon in place which is acting like an absorbent agent. And also, there probably was a fairly unknown quantity of the contaminants. Were the drums full, were they just sludges, were they water; you know, really, what was the volume. That's hard to determine. Probably none of the drums were full when they were placed.

Well, after we get the Remedial Investigation done, the next phase of this thing, the FS, is, where do we go from here? How do we clean this up? What do we do? Remediation alternatives must meet certain criteria under MTCA. They have to be protective of human health and the environment, they have to comply with cleanup standards, they have to comply with applicable --

UNIDENTIFIED SPEAKER: Relevant and appropriate --

MR. PANCOAST: Right.

UNIDENTIFIED SPEAKER: -- laws.

MR. PANCOAST: They are, basically, laws. So we have to comply with all the local laws and state laws and federal laws. We also have to have a provision in the remedial alternative that provides for compliance monitoring. Did we do something, has it been effective, is there any other laws of concern. So compliance monitoring is a very important aspect of remedial alternatives.

The Feasibility Study, basically, evaluates alternatives for site remediation -- how do we clean it up -- and as applicable, considers reusing, recycling, destroying, detoxifying the material, separating it, or volume reduction, immobilizing the waste in place, on- or off-site disposal at engineering facilities -- that's going to be like Arlington, which is an engineering facility with multiple liners and detection systems -- containment of the contamination, and institutional controls and monitoring.

For the Landsburg site, we basically selected for the initial screening, nine alternatives that were evaluated, and I'll go through these in a little detail here as we go through the slides. But basically, they ranged from no action, to institutional controls and just monitoring, which is usually putting up a fence and checking the monitoring wells, to backfilling the trench, to putting a soil cap on it, to putting a better low-permeability soil cap on it, to putting a flexible membrane liner, which is like a big thick, plastic over it, to putting a flexible membrane liner and a geosynthetic clay liner, which is a kind of fabric that has a clay material in it that expands, to excavation and off-site disposal of surficial soils, capping it, and then excavation and off-site disposal of all the waste and all the soils.

So you can see it runs, basically, the gamut from doing virtually nothing, no action, all the way to a fairly extensive operation that would be excavating an off-site disposal of the materials.

The "no action" is, basically, the current site conditions. "No monitoring," as we talked about. Institutional controls usually involves deep restrictions: Fencing, warning signs, you check one every now and then, and you monitor it. We looked at trench backfilling. Could we just backfill the trench and grade it to get the water out, and would that work. And over here in the far right column, you basically see the remedial alternatives that were carried forward to the next phase, that we actually do some engineering analyses of the preferred alternative. Really, the trench backfilling wouldn't give us what we needed here. It was not a real improvement over doing some various other alternatives, so it was not carried forward in the evaluation process.

Soil caps. Soil caps -- basically, backfilling the trench and placing a clean soil cap over the trench, doing the storm water control, and maintaining the cap. A low-permeability soil cap is a little bit of an improvement on this. We backfill and grade the trench as we did under a soil cap. Now we place a low-permeability soil cap over the trench backfill to keep the water from infiltrating into the materials that is placed within the trench.

Basically, we look at different alternatives to this. We look at a flexible membrane cap. Can we use a plastic material to get away from using so much low-permeability soils, and then we looked at a fairly extensive, kind of double system here. We have flexible membrane liner, and then a geosynthetic clay liner here to get kind of a double effect on the cap. So we're looking at all the ranges of potentially capping.

Basically, these things we talked about -- backfilling, placing various types of caps -- are containment concepts where the waste is left here in place, probably surrounded by some coal refuse. The trench is partially backfilled by scraping in the sides and any material that might be up on top, just as an additional safety factor; make sure we get everything. It's backfilled, covered with some sort of cap, a vegetated cover is placed over it, and then there is various types of drainage, or surface water control, so that we prevent infiltration of rain coming down and going through this waste and carrying contaminants down to the ground water. And any surface water that comes in from the side is, basically, caught in some sort of drainage collection system and carried off the site before it has a chance to infiltrate. So that the major design constraint on this containment thing is to prevent any additional water leading into the system.

Here are the cap designs that we evaluated. And as you can see, they range from a soil cap where we have the trench backfilled, about 18 inches of clean soil, and six inches of vegetation, to the low-permeability soil cap where we have now two feet of very compacted, low-permeability, 10 to minus-six soil on top of the trench backfill, then our vegetation cover.

An FML cover is, basically, a little geotextile with the synthetic flexible membrane liner. It's like a very thick plastic, black plastic layer that prevents water from infiltrating. And kind of a double system we looked at was flexible membrane liner and a geosynthetic clay liner like we talked about. So basically, we have a double liner system here incorporated above the trench backfill.

We also looked at two other options, which were excavation and off-site disposal of surficial affected soils, and then doing some capping. This one was not retained because it was -- basically, parts of it were carried forward under other alternatives, and it really was not just -- not as effective. We had to look at the actual engineering behind it.

The one we did carry forward, though, was the excavation and off-site disposal of all waste and all affected soil. This, basically, involves excavating the trench, which is no minor feat. I'm sure most of you can understand that. You have to lay back the walls of the trench. It involves putting operators and workers down in a fairly -- fairly hazardous environment. You, basically, treat the excavated material on-site or off-site depending on what the material is and how much you want to stage to the area. And then, basically, you're hauling the excavated waste out on the roads to another disposal facility such as Arlington. So, really, we're taking the waste from here and relocating it to a land disposal.

Under the MTCA evaluation criteria, we have to look at several different criteria that are important in determining a remedial selection. What's the long-term, short-term effect, and what's the reliability of the system, what's the reduction in toxicity, mobility, and volume of the contaminants, how implementable is it, how readily can we really do it, what's the cost factors involved in the remediation, and what's the community acceptance.

And so what's done in the evaluation of these alternatives as it begins to enter into an engineering study where we -- we take, basically, these other criteria up here, everything but cost, and it's used to generate a net benefit that we compare to the cost.

So it's like everything in life. If we bought kind of a net benefit -- say, if you were going to buy a car, you could plot over here, you know, net benefit; you know, what does the car give me, and then what's the cost of the car. And so we have a curve that would go up, and we'd be getting a lot better car as we spend more money. But somewhere, at some point, it would kind of level off. We're really not getting much of a car. One with a fancy name, or whatever. It's going to do the same thing. And it's just, we're not getting much more, but the cost seems to go up here. Lexus, BMW, so forth. And so most curves have to go up. You get a pretty good benefit/cost for awhile, and then they tend to level off.

And so this is a good way of comparing this. This, basically, just shows the different comparisons of the -- up here we have the low-permeability soil cap, FML cap, FML/GCL cap, soil cap, clustered up here. We show that very low cost, very low benefit down here for institutional controls, no action, and excavation and disposal. And this is -- obviously shows at a very high cost but, also, kind of a low net benefit because there is -- as you're opening up this trench, and you're kind of spreading stuff around -- so there are some impacts, both ecological, and to workers, and to communities. You have to haul this stuff out. So when you begin to look at, really, what are the benefits, this is how the things plot out.

And so if we look at, really, this cluster up here -- I'll expand this out a little bit so you can see. When we plotted these things up and began to look at comparing these various caps and containment alternatives, Alternative 5, which is the low-permeability soil cap, became the preferred alternative. The low-permeability soil cap, if you remember, is the one where we place about two feet of very low-permeable soil in the area and then control the surface water; control the runoff that's going into the trench. When we began to look at what is the effective cost, essentially, of adding plastic layers and adding more clay, the amount of additional water that was prevented from entering the system really didn't result in any net benefit. So we have kind of achieved our goal by using very low-permeability soils. And adding additional systems on top of that did not result in any increased benefit.

Alternative 5, the low-permeability soil cap, meets all the MTCA criteria: Protecting human health and environment, it complies with the cleanup standards and ARARS, and it provides for compliance monitoring. And Alternative 5, the low-permeability soil cap, is permanent to the maximum extent practical and provided the best net benefit.

The low-permeability soil cap provides an optimum combination of short-term effectiveness, long-term effectiveness. It's a very reliable system. It's easy to repair. If there is any type of additional subsidence or movement from the trench, it's very easy to take that minimum amount of equipment back up there and repair the cap. Whereas, if we have plastics with more complex systems, and other things, that becomes -- becomes much more of an ordeal, and more involved to try and repair these systems. So it has a very good reliability. It's very implementable, it has minimal impacts to community, and again, it's permanent to the maximum extent practical.

So basically, what this looks like -- and I apologize again for the slide. But the original grade on the trench would be scraped off a little bit. We would scrape off this material which was the roadway where the old trucks used to back up and dump the drums down, what was the staging area for some of the actions that have occurred. All this material would be pushed in the trench, along with additional backfilled material. And then, basically, on top of this backfilled material, we would place some sort of cap mechanism, and this would, again, prevent any type of infiltration -- or, significantly reduce any amount of infiltration that would act to drive contaminants from these drums, lower down to the water table.

We would also have surface water control so that any water flowing down the hill toward the trench would be diverted. So it looks a little bit like this when it's done. This was the area where the waste was disposed. This was the old haul road that came in over the rock bridge; the areas where the waste was placed. These would be filled, a low-permeability soil cap would be placed, a vegetative cover would be put on top of it that would be planted usually with grass, and then a series of channelizations would be placed around the trench to, basically, collect and divert water that would be flowing in from little side creeks and flowing down the hill, from entering into the landfill mass. So basically, we've significantly reduced what is the current state of affairs, which is water running downhill and into the trench.

Right now, all the rainwater that flows, goes into the trench. And even with this massive amount of water flowing in the trench right now, we see no effect to the ground water. So the effect of doing this is, we remove the drying mechanism to dry any future contamination that may lead to whatever in getting down to ground water and preventing, basically, containing the waste in place.

So what's the community impact of, kind of, this preferred alternative? Well, one of the benefits of this preferred alternative is that this is one of the least disruptive. It's going to be relatively short-term. The contractor is out at a fairly remote site. It's going to be up on top of the hill over there. It will be almost identical to a golf club project. It would be, basically, scraping dirt. They will be -- the activities will strictly be normal working hours, and there will be some minimal additional truck traffic bringing massive low-permeability soils, along with backfilled material. We hope to be able to get into -- find sources directly on the site. So they probably would be bringing minimal additional truck traffic.

The long-term impacts are very, very minor. Every now and then, there are some periodic routine monitoring of the cap. This is a guy in a pickup truck, basically, going up there, checking to make sure everything is fine. On a quarterly or semiannual basis, people are going to be going up and sampling the wells. And then if something happened where we get a little settling or something, there may be some infrequent cap maintenance, going up there with a little dozer for something that's affecting or occurring in the cap. So really, the long-term impacts on the community are pretty minor.

So how soon? What's the next step? Where do we go from here? Well, as David talked about, the next step in the process is this CAP; this Cleanup Action Plan. Basically, after we receive public comment from you and from others in the report that we prepared, we take that report, and in consultation with Ecology, and talking to Ecology, they prepare a Cleanup Action Plan; CAP. This comes back to the PLP group under, usually, a Consent Decree, an Agreed Order. And after the CAP is selected through some public hearings, and finalized, we begin to prepare the various engineering design reports that are required. Obviously, if you're going to be building something, you got to design it, so we'll have cross-sections and profiles. And where does the soil come from; how many trucks. The whole thing will be laid out in very -- very engineering-quality reports, and there is a whole series of other things. Monitoring wells; how you do operation and maintenance on the finalized cap design.

As part of this package, a contractor bid document would be prepared and a contractor selected. And currently, we're anticipating, if we can meet all the windows that we've got, probably, the contract to actually start moving dirt and cleaning up the site -- we could be out there performing the work during the summer of 1997. This looks like the best window of opportunity. That's a good construction season. And this seems like a target that we can meet.

And then following construction of the remedial option, we go into confirmatory ground water monitoring and operation and maintenance. And this, basically, would go on indefinitely for 20 years or better and involve routine monitoring and maintenance of the selected remedial option. That's all I have. It was pretty quick. I didn't get a lot of time here. But I want to encourage you, if you have any questions, there will be a question-and-answer period. There are four of us from Golder here, and four of the principal authors of the document. We'll be more than happy to explain anything, or if there are any questions, to try and answer them.

MS. DEPPMAN: I'd like to ask the people, at the end of the meeting, to come and sign in so we are sure to have a record of who was here, and also make sure that you leave your mailing on the project.

MR. SOUTH: I'd also like to mention, we have representatives from Landsburg Steering Committee here. Palmer Coking Coal is here. So certainly representatives of the Landsburg Steering Committee have come to the meeting.

MS. DEPPMAN: We'll open up for questions. We do want to make sure that we get to the comments; that folks who have come to make oral comments, they do so. We were going to leave time in the end, and I think we'll have enough time. Are there questions?

UNIDENTIFIED SPEAKER: In the Remedial Investigation, a number of tests were drilled to see whether or not there was any migration of contaminants. These test wells are, what, several hundred feet from the trench? They were in-between the trench and the water wells that were of concern.

MR. PANCOAST: Right. Basically, two nesting pairs were placed right at the end of the mines, right where we -- right at the end of the mine workings. So we made a very highly conductive environment. So we had kind of, basically, a pipe, or a slot, at a trench, right at the end of that trench, and they will be moving up and down the trench to do a test.

And when we placed one well that was actually up, right in the middle between the two major waste deposit areas -- that was placed between them. And then because there was a full-type fault that runs between them, we want to make sure that there was no cross-strata -- across the rock -- later migration out of this mine.